Materials Engineering Branch

TIP*

No. 003 Ball Bearing Surface Finish

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The achievement of long life with low drag torque in spacecraft ball bearings is significantly enhanced by fine surface finishes on the balls and races. When finishes are fine, then the amount of lubricant necessary to provide the thin separating film is at a minimum and the drag torque (viscous friction) ordinarily caused by excess lubricant is eliminated. In addition, the coulomb friction of metal-to-metal contact is eliminated when a separating film is maintained.

The mere stipulation of a required finish in the bearing procurement specification is no guarantee that the desired fine finish is obtained. A common bearing finish stipulation is 2 micro inches, rms. However, such a finish is obtainable with a variety of peak-to-peak surface roughnesses and is not an adequate stipulation. Actually, it is the peak-to-peak roughness that should be as small as possible. It has been our experience that if the rms finish is less than 1micro inch, then the peak-to-peak finish will be in the neighborhood of about 2 micro inches.

The surface finish should be checked by microscopic examination of the balls and races of a randomly selected bearing from the lot at a minimum of 200X magnification. At such a magnification the surfaces of the balls and of the ball grooves should be almost featureless.

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